

# Notice No.2

## for the Code for Lifting Appliances in a Marine Environment July 2017

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note for the corrigenda items paragraphs, Tables and Figures are not shown in their entirety.

Issue date: December 2017

Amendments to	Effective date	IACs/IMO implementation (if applicable)
General Regulations, Sections 3 & 5	1 January 2018	N/A
Chapter 1, Sections 1 & 2	1 January 2018	N/A
Chapter 4, Sections 6 & 8	1 January 2018	N/A
Chapter 9, Sections 1, 2, 3, 4 & 6	1 January 2018	N/A

# General Regulations

## ■ Section 3 Technical Committee

3.1 ~~LR's Technical Committee is at present composed of a maximum of 80 members which includes:~~ LR maintains a Technical Committee, at present comprised of a maximum of 80 members, and additionally an Offshore Technical Committee with specific responsibility for LR's Rules for Offshore Units, at present comprised of a maximum of 80 members. Membership of the Technical Committees includes:

*Ex officio members:*

- Chairman and Chief Executive Officer of Lloyd's Register Group Limited
- Chairman of the Classification Committee of Lloyd's Register Group Limited

*Members Nominated by:*

- Technical Committee ~~or Offshore Technical Committee~~
- Professional bodies representing technical disciplines relevant to the industry
- National and International trade associations with competence relevant to technical issues related to LR's business

3.2 In addition to the foregoing:

- (a) Each National or Area Committee may appoint a representative to attend meetings of the Technical Committees.
- (b) A maximum of five further representatives from National Administrations may be co-opted to serve on the Technical Committees. Representatives from National Administrations may also be elected as members of the Technical Committees as Nominated Members
- (c) Further persons may be co-opted to serve on the Technical Committees by the ~~relevant~~ Technical Committee.

3.3 All elections are subject to confirmation by the Board.

3.4 The function of the Technical Committees is to consider:

- (a) any technical issues connected with LR's business;
- (b) any proposed alterations in the existing Rules;
- (c) any new Rules for classification;

Where changes to the Rules are necessitated by mandatory implementation of International Conventions and Codes, or Common Rules, Unified Requirements and Interpretations adopted by the International Association of Classification Societies, these may be implemented by LR without consideration by the ~~relevant~~ Technical Committee, although any such changes ~~will~~ ~~may~~ be provided to the Technical Committees for information.

Where changes to the Rules are required by LR to enable existing technical requirements within the Rules to be recognised as Class Notations or Descriptive Notes, these may be implemented by LR without consideration by the ~~relevant~~ Technical Committee, although any such changes will be provided to the ~~relevant~~ Technical Committee for information.

3.5 The term of office of the Chairman and of all members of ~~the~~ ~~each~~ Technical Committee is five years. Members may be re-elected to serve an additional term of office with the approval of the Board. The term of office of the Chairman may be extended with the approval of the Board.

3.6 In the case of continuous non-attendance of a member, the ~~relevant~~ Technical Committee may withdraw membership.

3.7 Meetings of the Technical Committees are convened as often and at such times and places as is necessary, but there is to be at least one meeting in each year. ~~Urgent matters~~ ~~Matters~~ may ~~also~~ be considered by the Technical Committees by correspondence.

3.8 Any proposal involving any alteration in, or addition to the General Regulations, of Rules for Classification is subject to approval of the Board. All other proposals for additions to or alterations to the Rules for Classification other than the General Regulations, will following consideration and approval by the ~~relevant~~ Technical Committee either at a meeting of ~~the~~ ~~that~~ Technical Committee or by correspondence, be recommended to the Board for adoption.

3.9 The Technical Committees ~~is~~ ~~are~~ empowered to:

- (a) appoint sub-Committees or panels; and
- (b) co-opt to the Technical Committee, or to its sub-Committees or panels, representatives of any organisation or industry or private individuals for the purpose of considering any particular problem.

## ■ Section 5

### **Applicability of Classification Rules and Disclosure of Information**

5.1 LR has the power to adopt, and publish as deemed necessary, Rules relating to classification and has (in relation thereto) provided the following:

- (a) Except in the case of a special directive by the Board, no new Regulation or alteration to any existing Regulation relating to classification or to class notations is to be applied to existing ships.
- (b) Except in the case of a special directive by the Board, or where changes necessitated by mandatory implementation of International Conventions, Codes or Unified Requirements adopted by the International Association of Classification Societies are concerned, no new Rule or alteration in any existing Rule is to be applied compulsorily after the date on which the contract between the ship builder and shipowner for construction of the ship has been signed, nor within six months of its adoption. The date of 'contract for construction' of a ship is the date on which the contract to build the ship is signed between the prospective shipowner and the ship builder. This date and the construction number (i.e. hull numbers) of all the vessels included in the contract are to be declared by the party applying for the assignment of class to a newbuilding. The date of 'contract for construction' of a series of sister ships, including specified optional ships for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective shipowner and the ship builder. In this section a 'series of sister ships' is a series of ships built to the same approved plans for classification purposes, under a single contract for construction. The optional ships will be considered part of the same series of sister ships if the option is exercised not later than 1 year after the contract to build the series was signed. If a contract for construction is later amended to include additional ships or additional options, the date of 'contract for construction' for such ships is the date on which the amendment to the contract is signed between the prospective shipowner and the ship builder. The amendment to the contract is to be considered as a 'new contract'. If a contract for construction is amended to change the ship type, the date of 'contract for construction' of this modified vessel, or vessels, is the date on which the revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder. Where it is desired to use existing approved ship or machinery plans for a new contract, written application is to be made to LR. Sister ships may have minor design alterations provided that such alterations do not affect matters related to classification, or if the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the ship builder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to LR for approval. Recognising the long time period that may occur between the initial design contract and the contract for construction for offshore units for fixed locations, the date determining effective classification requirements will be specially considered by LR in such cases.
- (c) All reports of survey are to be made by surveyors authorised by members of the LR Group to survey and report (hereinafter referred to as 'the Surveyors') according to the form prescribed, and submitted for the consideration of the Classification Committee.
- (d) Information contained in the reports of classification and statutory surveys will be made available to the relevant owner, National Administration, Port State Administration, P&I Club, hull underwriter and, if authorised in writing by that owner, to any other person or organisation.
- (e) Notwithstanding the general duty of confidentiality owed by LR to its client in accordance with the LR Rules, LR clients hereby accept that, LR will participate in the IACS Early Warning System which requires each IACS member to provide its fellow IACS members and Associates with relevant technical information on serious hull structural and engineering systems failures, as defined in the IACS Early Warning System (but not including any drawings relating to the ship which may be the specific property of another party), to enable such useful information to be shared and utilised to facilitate the proper working of the IACS Early Warning System. LR will provide its client with written details of such information upon sending the same to IACS Members and Associates.
- (f) Information relating to the status of classification and statutory surveys and suspensions/withdrawals of class together with any associated conditions of class will be made available as required by applicable legislation or court order.
- (g) A Classification Executive consisting of senior members of LR's Classification Department staff shall carry out whatever duties that may be within the function of the Classification Committee that the Classification Committee assigns to it.

# Chapter 1

## General

### ■ Section 1 Introduction

#### 1.3 Classification

~~1.3.1 Ships and offshore installations built in accordance with LR's Rules with respect to hull and machinery are eligible to be assigned a class in the Register Book and continue to be classed, as long as it is found upon examination at the prescribed surveys that they are maintained in accordance with the Rules.~~

~~1.3.2~~ **1.3.1** Ships or offshore units classed with LR and fitted with lifting appliances built in accordance with the requirement of this Code will be eligible to be assigned Special Features class notations in the *Register Book* as listed in *Table 1.1.1 Special features class notations associated with lifting appliances*.

**Table 1.1.1 Special features class notations associated with lifting appliances**

Lifting appliance	Special features class notation	Remarks
Cargo gear, derricks, derrick cranes or cranes on vessels	<b>CG</b>	<i>Optional notation.</i> Indicates that the ship's vessel's cargo gear is included in class.
Cranes on offshore units, offshore installations and offshore support vessels	<b>OC</b>	<i>Optional notation.</i> Indicates that the installation's, unit's or vessel's main deck cranes are included in class.
Pipe laying system	<b>PLS</b>	<i>Optional notation.</i> Indicates that the pipe laying system is included in class.
Personnel transfer system (Walk-to-Work)	<b>W2W</b>	<i>Optional notation.</i> Indicates that the personnel transfer system is included in class.
Lifts and ramps on ships vessels	<b>CL</b> <b>PL</b> <b>CR</b>	<i>Optional notations.</i> Indicate that the ship's vessel's cargo lifts (CL), passenger lifts (PL) or cargo ramps (CR) are included in class.
Lifting appliances fitted to military naval ships vessels	<b>LAP</b>	<i>Optional notation</i> Indicates that lifting appliances have been designed and built in accordance with this Code (or equivalent standard), but where it is not mandated by the LA notation
Lifting appliances forming an essential feature of the vessel, e.g. cranes on crane barges or pontoons, lifting arrangements for diving on diving support vessels ships, etc.	<b>LA</b>	<i>Mandatory notation.</i> Indicates that the lifting appliance is included in class.
Lifting appliances forming an essential feature of the vessel where the appliance(s) has been classed by a recognised classification society other than LR and later transferred into class with LR.	<b>LA</b>	<i>Mandatory notation.</i> Indicates that the lifting appliance is classed and that initial requirements for the appliance were that of another recognised classification society.

~~1.3.3~~ **1.3.2** Where the lifting appliance is considered to form an essential feature of a classed ship vessel, the Special Feature class notation **LA** or **LA** will, in general, be mandatory.

*Existing paragraphs 1.3.4 to 1.3.8 have been renumbered 1.3.3 to 1.3.7.*

**1.3.8** From the time the **LA** notation is assigned, the subject appliance(s) will be tested and surveyed in accordance with the requirements of *Ch 12, Testing, Marking and Surveys*.

## ■ Section 2 Definitions

### 2.3 Service category

(Part only shown)

2.3.1 **Standard service category.** This is the least onerous operational category which can be adopted for the purpose of ascertaining the ~~safe working load~~ Safe Working Load (SWL) of any appliance. It is to embrace all of the following conditions:

- (c) The appliance being operated in wind speeds not exceeding 20 m/s, corresponding to a wind pressure not exceeding 250 N/m<sup>2</sup>. The stowage wind speed is to be taken as at least 63 m/s. Proposals for the application of other wind speeds will be specially considered. All wind speeds are to be related to gust wind speeds averaged over a duration of 3 seconds.

(Part only shown)

2.3.2 **Specified service category.** This is an operational category which is specified by the designer or Operator for the purpose of designing the appliance for the ~~safe working load~~ Safe Working Load (SWL). It is more onerous than the Standard Service Category by virtue of any of the following operational and environmental conditions being applicable:

- (c) The appliance being operated in wind speeds exceeding 20 m/s, corresponding to a wind pressure exceeding 250 N/m<sup>2</sup>. The stowage wind speed is to be taken as at least 63 m/s. Proposals for the application of other wind speeds will be specially considered. All wind speeds are to be related to gust wind speeds averaged over a duration of 3 seconds.

## Chapter 4

### Cranes and Submersible Lifting Appliances

#### ■ Section 6

#### Handling of personnel

##### 6.3 Design requirements

6.3.1 The crane operator's control panel is to be equipped with a dedicated manual switch for the purpose of engaging personnel handling operations, including a continuous visual indication (e.g. warning light) that the personnel handling mode is activated. Automatic or manual overload protection systems, constant tension systems or motion compensation systems, if installed, are to be automatically switched off when the personnel handling is activated. For retrofits, alternative proposals will be specially considered.

~~6.3.4 The crane's hoisting and (where fitted) luffing winches intended to be used for personnel handling operations are to be fitted with primary automatic type brakes. These are to be of the interlocking type, where a failure of the power source will cause the brake to be applied.~~

~~6.3.5 The hoisting and (where fitted) luffing winches are to be equipped with mechanically and operationally independent additional braking systems. The control system for these additional brakes is to be independent of the primary working brake. Both primary and secondary brakes are to be automatically activated in case of the emergency stop being activated or in the event of a power failure.~~

~~6.3.6 The additional brake system is to operate directly on the winch drum. Other proposals (e.g. a fully independent load path) will be specially considered.~~

~~6.3.7 The winch brakes are to be fitted with a manual override and means are to be provided to enable the recovery (hoisting or lowering) of the lifted personnel to safety from any position in the event of a power failure.~~

~~6.3.8 A minimum number of three wraps of steel wire rope are required to remain on the winch drum at all times.~~

~~6.3.9 Where hydraulic cylinders are used for luffing, folding or telescoping, they are to be fitted with non-return valves at both inlet and outlet manifolds to ensure that the cylinders remain in position in the event of a hydraulic failure. The required non-return valves are to be fitted directly to the cylinder ports.~~

~~6.3.10~~ 6.3.4 ~~Securable safety latches are to be fitted to the hooks. The design of the hook shall be such that inadvertent opening is prevented (e.g. by means of securable safety latches or any other suitable means).~~

##### 6.4 Additional testing and survey requirements

~~6.4.1 Each of the two independent brakes is to be statically tested to at least 1,5 times the rated load for personnel handling and dynamically tested to at least 1,1 times the rated load for personnel handling.~~

*Existing paragraphs 6.4.2 and 6.4.3 have been renumbered 6.4.1 and 6.4.2.*

#### ■ Section 8

#### Specific design requirements

##### 8.1 Travelling lifting appliances

8.1.1 Lifting appliances or their components (e.g. engine room cranes or trolleys) which travel along a track or rails shall be provided with a rack and pinion arrangement or alternative means of ensuring that an uncontrolled movement along the track or rails is prevented. Alternative proposals will be specially considered.

# Chapter 9 Machinery

## ■ Section 1 Introduction

### 1.1 General

~~1.1.2 Where the lifting machinery is to be included in the classification equipment of the installation, the following requirements are to be complied with. Where third party design verification is to be considered, the requirements of this Section may be considered for guidance purposes only.~~

1.1.2 The following requirements are to be complied with as defined in *Table 13.2.1 Minimum requirements for the certification of lifting appliances* and *Table 13.3.1 Minimum requirements for the classification of lifting appliances*. Where plan approval is not required by the Tables of *Ch 13 Documentation*, it is the sole responsibility of the manufacturer of the equipment to comply and verify compliance with the requirements of this Chapter. Any proposal to deviate from the requirements of the Code will be specially considered.

~~1.1.3 Third party design verification is to be carried out in accordance with a specified National or International recognised design Standard or the submitted manufacturer's design specifications (with the exception of survival craft and rescue boats).~~

1.1.3 The requirements specified in this Chapter are applicable to lifting appliances fitted with steel wire ropes. The application of fibre ropes and any additional requirements will be specially considered.

## ■ Section 2 Design and construction of machinery

### 2.1 Plans and information to be submitted

~~2.1.1 Detailed design drawings are to be submitted, one copy of which will be retained by Lloyd's Register (LR).~~

~~2.1.2~~ 2.1.1 Details of the proposed principles of operation of the equipment, together with the design specifications, including the applied loads of the lifting ~~device~~ appliance to be appraised.

~~2.1.3~~ 2.1.2 Calculations of the power and braking requirements of the winch system(s).

~~2.1.4~~ 2.1.3 Detailed design plans and calculations of the machinery which include details of gearing, torque transmitting shafting together with all couplings (keys, splines, flanges, etc.), bearings, clutches and assembly details, rope drum including full fabrication details, braking device(s) and the attachment of the machinery to the supporting structure. ~~An FE analysis of the rope drum strength evaluation is to be submitted for consideration in place of the rope drum design calculations.~~ All material specifications and mechanical properties are to be provided for each component.

~~2.1.5~~ 2.1.4 Details of the rope drum(s) storage under all operating conditions are to be ~~advised~~ provided, indicating the maximum number of rope layers to be considered under working conditions.

~~2.1.6~~ 2.1.5 Details of the general arrangement, showing rope orientation and securing devices, and sectional arrangement of the machinery.

~~2.1.7~~ 2.1.6 Diagrammatic arrangement plans of the hydraulic and pneumatic piping systems, where fitted, together with specifications of the principal components.

~~2.1.8~~ 2.1.7 Where hydraulic power packs are of proprietary manufacture, they are to be ~~LR~~ Type Approved by LR. Alternatively, operational parameters and detailed plans including materials lists and mechanical properties of the components of the system and any manufacturer's catalogues as applicable are to be submitted.

~~2.1.9~~ 2.1.8 For electrically powered lifting equipment see *Ch 10 Electrotechnical Systems* and *Ch 11 Materials and Fabrication*.

~~2.1.10~~ 2.1.9 Details of torque limiting and over-run/under-run limiting devices, where fitted.

~~2.1.11~~ 2.1.10 If ~~proprietary equipment, such as gearboxes or brakes, is to be included in the machinery, it is to be Type Approved by LR.~~ Where proprietary equipment, such as gearboxes, brakes or clutches, is included in the machinery, it is to be Type Approved by LR, and is to cover not less than the full load spectrum of the machinery associated with the lifting appliance. Alternatively, operational parameters and detailed plans, including materials lists and mechanical properties of the components of the system and any manufacturer's catalogues as applicable, are to be submitted.

**2.1.11** Details/plans of the foundation securing arrangements, including materials and mechanical properties, are to be submitted. Calculations demonstrating the strength of the foundation securing arrangements under the maximum loaded condition of the lifting appliance are to be submitted. These should include any dynamic effects on the system.

## **2.2 Materials**

**2.2.1** The materials applied are to be in compliance with *Ch 1, 1.6 Materials and fabrication*, *Ch 11 Materials and Fabrication* and relevant sections related to materials in the individual Chapters. The fabrication is to be in compliance with *Ch 11 Materials and Fabrication*.

**2.2.2** The required material certificates are given in *Table 13.2.1 Minimum requirements for the certification of lifting appliances* and *Table 13.3.1 Minimum requirements for the classification of lifting appliances* as applicable.

**2.2.3** In cases where machinery is exposed to the environment, demonstration of a material's suitability for operations at low temperature is required. High strength structural steels are to be in compliance with the impact test requirements as listed in *Ch 4, 2.25 Materials*. Machinery components fabricated from alloy steels such as 42CrMo4QT and 34CrNiMo6QT are to be in compliance with *Ch 4, 2.25 Materials 2.25.5* and impact tested as per *Ch 4, 2.25 Materials 2.25.6*.

**2.2.4** Materials for use in hazardous environments are to be in accordance with a recognised National or International Standard. The Standard used is to be identified in the submitted specification.

## **Section 3 Mechanical design requirements**

*Existing Section 3 has been deleted in its entirety and replaced with below.*

### **3.1 Allowable stresses**

**3.1.1** All structural and mechanical components such as winch frames, spoolers, wire tensioners, fairleads, support and drive shafts, except rope drums (see *Ch 9, 3.4 Rope drums*), are to be designed to comply with the allowable stresses as given in the applicable Chapters of the Code, i.e.:

- (a) For launch and recovery appliances for survival craft and rescue boats see:
  - (i) *Ch 3, 1.6 Safety factors 1.6.1*; and
  - (ii) *Ch 3, 1.8 Davit winches 1.8.2*.
- (b) For cranes and submersible lifting appliances see:
  - (i) *Ch 4, 2.17 Allowable stress – Elastic failure*;
  - (ii) *Ch 4, 2.18 Allowable stress – Compression, torsional and bending members*;
  - (iii) *Ch 4, 2.21 Allowable stress – Plate buckling failure*; and
  - (iv) *Ch 4, 2.23 Allowable stress – Joints and connections*.
- (c) For shiplift and transfer systems see:
  - (i) *Ch 5, 5.7 Allowable stresses*.
- (d) For ro-ro access equipment see:
  - (i) *Ch 6, 2.6 Allowable stress – Elastic failure*; and
  - (ii) *Ch 6, 2.7 Allowable stress – Plate buckling failure*.
- (e) For lifts see:
  - (i) *Ch 7, 2.6 Allowable stresses*.

**3.1.2** Winches for derrick systems will be specially considered.

**3.1.3** Proprietary components such as hydraulic motors/pumps will be specially considered.

### **3.2 Loads**

**3.2.1** Loads on structural and mechanical components as detailed in *Ch 9, 3.1 Allowable stresses 3.1.1* are defined in *Ch 1, 2 Definitions* and the relevant Sections in the Chapters applicable to the lifting appliance under consideration. All loads on subject components are to be taken as factored loads unless stated otherwise in this Chapter.

### **3.3 Power supply**

**3.3.1** The output rating of the power supply is to be designed taking the full load spectrum of the lifting appliance into account, i.e. short-term peak power and long-term nominal power.

### **3.4 Rope drums**

**3.4.1** The design of rope drums is to be in accordance with a recognised National or International Standard or a recognised calculation methodology considered acceptable by LR, taking the following criteria into account:

- (a) The maximum load under spooling as defined by the selected standard or calculation method;



- (b) The maximum holding force from brake or motor;
- (c) The corresponding maximum and minimum number of rope layers on the drum;
- (d) Where large lengths of rope are to be handled, the capacity of the drum is usually to be designed in such a way as to accommodate the rope on a maximum of three layers of rope. Where a greater number of rope layers are required, suitable spooling arrangements are to be considered (e.g. helical grooving, mechanical spooling device);
- (e) The rope end shall be adequately secured to the winch drum. The dimensioning of the rope connection to the drum shall be compatible with the concept of automatic or manual overload protection systems (if fitted) and the performance of their technical protection concept; and
- (f) A minimum number of three wraps of steel wire rope is to remain on the rope drum at all times during normal operation.

### 3.5 Gears and gearboxes

3.5.1 Gears are to be designed in accordance with a recognised National or International Standard such as ISO 6336, and the following details are to be submitted:

- (a) Full operational load spectrum;
- (b) Test loads of the crane (see *Ch 12, 1.6 Cranes and ROV handling systems*);
- (c) Detailed strength analysis report for both tooth root bending stress and surface stress (also known as Hertzian stress, contact stress or pitting resistance);
- (d) Details of the materials applied, including heat treatment, sufficient to establish all of the material parameters used in the stress analysis; and
- (e) Details of the manufacturing processes sufficient to establish the accuracy and quality parameters used in the stress analysis.

3.5.2 Gear teeth shall be dimensioned as per the requirements of ISO 6336 and the safety factors shall be as follows:

- (a) Root bending stress,  $S_{F \min} \geq 1,5$ ; and
- (b) Surface pressure,  $S_{H \min} \geq 1,0$ .

### 3.6 Shafting

3.6.1 Input, intermediate, output and gearing shafting is to be designed in accordance with a recognised National or International Standard (e.g. DIN 743), which is to be identified in the submitted calculations.

### 3.7 Shafting connections

3.7.1 Splines, flanges, keys, etc. are to comply with a recognised National or International Standard. Conical and parallel interference fit couplings, flanges, etc. are to be designed for a factor of safety against slippage of 2,0, taking the maximum factored load/torque into account.

### 3.8 Brakes

3.8.1 In general, brakes shall be designed to a recognised National or International Standard. In addition the following requirements are to be complied with.

3.8.2 Brakes and/or any form of braking due to the drive motor fitted to lifting appliances are to be designed to safely retard, stop and hold the load and/or crane boom and/or any other specific component of a lifting appliance at the full load-speed spectrum. Any braking effect of the drive system shall not be taken into account.

3.8.3 Brakes are to be fitted directly to the output drive component, i.e. a rope drum on a winch or the pinion on a rack and pinion drive. In case any transmission system (i.e. gear box) will be fitted between the brake and the output drive component, the transmission system is to be approved for a load which is equal to the maximum torque applied by the brake.

3.8.4 Brakes fitted to lifting appliances are to be selected for a load of not less than 1,6 times the maximum un-factored load. In case the requirements as detailed in *Ch 9, 3.8 Brakes 3.8.2* are not achieved by using a safety factor of 1,6 this safety factor has to be increased accordingly in order to comply with the requirements in *Ch 9, 3.8 Brakes 3.8.2*.

3.8.5 The minimum expected coefficient of friction (considering unfavourable conditions) is to be applied in the design calculation, which is not to exceed a friction coefficient of 0,3. Details of proof of friction coefficients exceeding this value are to be submitted for consideration.

3.8.6 The boom hoist system on offshore cranes is to be equipped with a secondary brake. Alternative proposals will be specially considered.

3.8.7 The primary mechanical ('parking') brake is to be automatically applied after the operating lever is in the 'off' or 'neutral' position, or on emergency stop application, and immediately upon the failure of the power supply to the motor and/or failure of the control system. Means are to be provided to override the application of the brakes if circumstances require (e.g. emergency lowering of the load), and details of the overriding procedure are to be available during testing for acceptance. The brake action is to avoid sudden dynamic shock loads to the winch and lifting appliance system.

### 3.9 Clutches

3.9.1 The rating of proprietary clutches fitted to lifting appliances is to provide a factor of safety of not less than 1,5 regarding slippage on the maximum factored load (see Ch 9, 3.2 Loads 3.2.1). Alternatively, operational parameters and detailed plans including materials lists and mechanical properties of the components of the system are to be submitted demonstrating compliance with Ch 9, 3.1 Allowable stresses 3.1.1.

### 3.10 Bearings

3.10.1 The rating of anti-friction roller bearings is to be verified in accordance with a recognised National or International Standard (e.g. ISO 281).

### 3.11 Slewing rings

3.11.1 Slewing rings and their bolting are to be in accordance with Ch 4, 2.24 Slewing ring and slewing ring bolting or Ch 4, 3.7 Slew rings (as applicable) or an equivalent recognised National or International Standard.

3.11.2 Where slewing rings employ anti-friction roller bearings, they are to be in accordance with Ch 9, 3.10 Bearings 3.10.1.

### 3.12 Pressure piping systems

3.12.1 Pressure piping systems are to be designed in accordance with the requirements of Pt 5, Ch 12 Piping Design Requirements, Pt 5, Ch 13 Ship Piping Systems and Pt 5, Ch 14 Machinery Piping Systems of LR's Rules and Regulations for the Classification Ships, July 2017. The application of recognised National or International Standards for pressure piping will be specially considered.

3.12.2 Hydraulic pumps fitted to power packs are to be type tested in accordance with the requirements of Pt 5, Ch 19, 7.1 Testing 7.1.3 of LR's Rules and Regulations for the Classification Ships, July 2017. The duration of the test is to be representative for the intended life cycle of the pump.

3.12.3 Fabrication of pressure piping is to be carried out as per the requirements given in Ch 13 Requirements for Welded Construction of LR's Rules for the Manufacture, Testing and Certification of Materials, July 2017 or a recognised National or International Standard for pressure piping.

3.12.4 Air vent arrangements on hydraulic oil tanks are to be such that over or under pressure will remain below the tank design pressure in all conditions of service. The number of pumps which are intended to run simultaneously is to be considered.

## ■ Section 4 **Man-riding and personnel lifting machinery Machinery engaged in handling of personnel**

### 4.1 Scope

4.1.1 In addition to Ch 9, 3 Mechanical design requirements, this Section specifies the requirements for the mechanical hoisting equipment for cranes and other equipment whose primary task is to perform unmanned operations but which may also be used for handling of personnel lifting (often called man-riding).

4.1.2 This Section does not cover the requirements for lifting appliances intended for manned diving operations, shiplift and transfer systems, ro-ro access equipment and lifts.

### 4.2 Cranes and winches used for handling of personnel man-riding operations

4.2.1 All hoisting equipment is to be equipped with a suitable primary braking device, mechanically operable under all operational load conditions. The design brake force is not to be less than 120 per cent of the brake force required to support the specified overload test. Proposals to make use of hydraulic locking of the drive motor as brake will be specially considered; however either the primary or the secondary brake is to be of the mechanical type. Hydraulic locking of the drive motor, where fitted, is not to be considered as a primary mechanical brake or as a secondary brake when using cranes for manriding operations.

4.2.2 The primary mechanical brake is to be automatically applied when the operating lever is in the 'off' or 'neutral' position. Brake action is to be progressive so as to avoid sudden dynamic shock loads to the system.

4.2.3 Primary automatic type mechanical brakes are to be fitted to both the hoisting and (where fitted) luffing boom and live load hoist winches. The live load for manriding purposes is considered as the weight of the hook, suspended hoist wire, the basket and a maximum of 4 persons. An allowance of 100 kg is to be allocated for each person. The live load for personnel lifting is not to be greater than 50 per cent of the SWL, certified for normal unmanned lifts at the maximum operating radius of the lifting appliance.

4.2.4 The primary brake is to be applied automatically upon the failure of the power supply to the motor and/or control devices.

4.2.3 The hoisting and (where fitted) luffing winches are to be equipped with mechanically and operationally independent secondary braking systems. The secondary brake system is to operate directly on the winch drum or drum shaft. Other proposals (e.g. a fully independent load path) will be specially considered.

4.2.4 The secondary brake system is to arrest all motions when the lifting appliance operator places the controls into the neutral position or in the event of an emergency (i.e. power or control system failure, emergency stop activated) during handling of personnel operations. The control system for these secondary brakes is to be independent of the primary brake. Both primary and secondary brakes are to be automatically activated in case of the emergency stop being activated or in the event of a power or control system failure. For winches driven by two motors both fitted with integral brakes, a separate secondary braking system is not required, provided that either motor/brake unit can provide the full personnel braking torque required by this Code and provided that the load path of both motors are independent of each other. Proposals which engage more than two motors will be specially considered.

*Existing paragraphs 4.2.5 and 4.2.6 have been deleted in their entirety.*

4.2.5 The winch brakes are to be fitted with a manual override and means are to be provided to enable the recovery (hoisting or lowering) of the lifted personnel to a safe location from any position in the event of a power failure.

4.2.7 4.2.6 The primary and secondary braking devices are to be tested independently. Each brake is to be statically tested to at least 1,5 times the un-factored load for personnel handling and dynamically tested to at least 1,1 times the un-factored load for personnel handling. The speeds at which the brakes are to be tested are as follows:

- (a) For the static test, the brakes shall be applied with the winch at standstill; and
- (b) for the dynamic test, the brakes shall be applied with the winch running at nominal speed until the winch reaches standstill.

4.2.7 The secondary brake is to have a brake torque which will result in a vertical acceleration which will not be in excess of the requirements of Ch 9, 4.2 *Cranes and winches used for handling of personnel* 4.2.11 and not impair the requirements of Ch 9, 4.2 *Cranes and winches used for handling of personnel* 4.2.4.

*Existing paragraphs 4.2.8 and 4.2.9 have been deleted in their entirety.*

4.2.10 4.2.8 An emergency stop is to be fitted, operable by the driver in the event of an emergency arising provided at each control station. See Ch 10, 4.1 *General* 4.1.4.

4.2.11 4.2.9 Any speed-change gearbox fitted is to be of the constant mesh type such that it is not possible to change the gear ratio while there is any load on the lifting system. Gearboxes, where fitted, are to be rated such that there is a factor of safety of at least 2,0 on the operational load.

*Existing paragraph 4.2.12 has been renumbered 4.2.10.*

4.2.11 Vertical accelerations, i.e. due to hoisting, lowering and emergency stop, which will harm personnel being handled by the lifting appliance, shall be avoided. The vertical acceleration shall not be in excess of the below given limits:

- (a) Normal operation (hoisting or lowering):  $\pm 1,5 \text{ m/s}^2$ ;
- (b) Emergency stop: 1,0g.

The lifting appliance system needs to be designed to withstand these maximum accelerations. The maximum hoisting or lowering speed shall be limited to 1,0 m/s. The basket or carrier being used for the handling of personnel is to be designed to a recognised National or International Standard and is to be certified for this purpose, see Ch 4, 6.2 *General requirements* 6.2.3.

*Existing paragraphs 4.2.13 and 4.2.14 have been deleted in their entirety.*

## ■ Section 6 Manufacture and Testing of machinery

### 6.1 Materials

6.1.1 ~~Materials used in the manufacture of winch machinery are to be in accordance with an internationally recognised Standard. Manufacturer's documentation indicating compliance with a recognised Code or Standard will be accepted.~~

6.1.2 ~~Materials for use in low temperature or hazardous environments are to be in accordance with a National or International Standard acceptable to LR. The Standard used is to be identified in the submitted specification.~~

### 6.2 6.1 Testing

6.2.16.1.1 Testing of lifting appliances and their machinery is to be in accordance with Ch 12 *Testing, Marking and Surveys*.

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